

What is claimed is:

1. A detector for detecting a signal at a signaling frequency on a transmission line carrying a communication signal comprising signaling frequencies and noise, said detector comprising:

5 a resonator having an input configured for coupling to the transmission line to receive the communication signal, an output for outputting a resonated signal, and a control used to configure said resonator;

a controller coupled to said control of said resonator for configuring said resonator in a first state corresponding to the signaling frequency and in a second state corresponding to a reference frequency; and

10 a comparator coupled to the output of said resonator for comparing a first value of said resonated signal at the output of said resonator configured in said first state to a second value of said resonated signal at the output of said resonator configured in said second state, said comparator generating an indicator based on the comparison.

15 2. The detector of claim 1, further comprising:

a running maximum circuit coupled between said resonator and said comparator for determining a first largest value of said resonated signal at said output of said resonator configured in said first state during a measurement period, said first largest value being said
20 first value, and determining a second largest value of said resonated signal at said output of said resonator configured in said second state during another measurement period, said second largest value being said second value; and

a counter coupled to said running maximum circuit and said controller for determining said measurement periods.

3. The detector of claim 2, further comprising:

5 a memory coupled to said state machine for storing data used by said controller to configure said resonator and for storing said first and second values.

4. The detector of claim 3, wherein said resonator comprises:

an accumulator having an input which is said input of said resonator, a first feedback input, a second feedback input, and an output which is said output of said resonator;

a first delay element having an input coupled to said output of said accumulator and an output, said first delay element introducing a first delay to said resonated signal;

a first feedback path coupled between said output of said first delay element and said first feedback input of said accumulator, said first feedback path comprising a multiplier configurable by said controller for multiplying said delayed resonated signal by a coefficient;

a second delay element having an input coupled to the output of said first delay element and an output, said second delay element introducing a second delay to said delayed resonated signal; and

a second feedback path between the output of said second delay element and the second feedback input of said accumulator.

5. The detector of claim 4, wherein said first delay element is a first latch and said second delay element is a second latch.

6. The detector of claim 2, further comprising:

a low pass filter having an output and an input for coupling to the transmission line, said low pass filter filtering out frequencies of the communication signal above a predefined frequency; and

5 an analog-to-digital converter having an input coupled to the output of said low pass filter and an output coupled to the input of said resonator for converting the filtered communication signal to a digital domain.

7. A tone detector for detecting the presence of a signaling tone on one of a plurality of potential signaling tone frequencies on a telephone line carrying a communication signal, said tone detector comprising:

a resonator having an input configured for receiving the communication signal, a control for configuring the resonator, and an output for outputting a resonated signal which is partially dependent on the configuration of said resonator; and

5 a state machine coupled to said resonator for configuring said resonator and processing said resonated signal generated by said resonator to produce an indicator.

8. The tone detector of claim 7, wherein;

said state machine configures said resonator in a first state corresponding to a frequency of the signaling tone for a measurement period to obtain a first value, said state
20 machine configures said resonator in a second state corresponding to a reference frequency for another measurement period to obtain a second value, and said state machine compares

said first value to said second value to generate said indicator if said first value exceeds said second value by a predefined amount.

9. The tone detector of claim 7, wherein;

5 said state machine configures said resonator in a first state corresponding to a frequency of the signaling tone for a measurement period to obtain a first value and compares said first value to a second value representing noise on the communication signal to generate said indicator if said first value exceeds said second value by a predefined amount.

10. The tone detector of claim 7, further comprising:

10 a low pass filter coupled between the telephone line and said resonator for filtering out frequencies above a desired frequency to reduce noise and aliasing; and

15 an analog-to-digital converter coupled between said low pass filter and said resonator for converting analog signals on the telephone line to digital signals for processing by said resonator and said state machine.

11. The tone detector of claim 7, wherein said state machine comprises:

20 a running maximum circuit coupled to the output of said resonator for detecting said first value and said second value during said measurement periods.

12. The tone detector of claim 11, wherein said tone detector further comprises:

 a counter coupled to said state machine for determining said measurement periods.

13. The tone detector of claim 8, wherein said resonator comprises:

an accumulator having a first input for receiving the communication signal, a first feedback input, a second feedback input, and an output for outputting said resonated signal;

a first delay element having an input coupled to said output of said accumulator and an output, said first delay element introducing a first delay to said resonated signal;

a first feedback path coupled between said output of said first delay element and said first feedback input of said accumulator, said first feedback path comprising a multiplier configurable by said state machine for multiplying said delayed resonated signal by a coefficient;

a second delay element having an input coupled to said output of said first delay element and an output, said second delay element introducing a second delay to said delayed resonated signal; and

a second feedback path coupled between said output of said second delay element and said second feedback input of said accumulator.

14. The tone detector of claim 13, wherein, in said first state, said coefficient is a function of the frequency of the signaling tone and a sampling frequency and, in said second state, said coefficient is a function of the frequency of said reference frequency and said sampling frequency.

15. The tone detector of claim 13, wherein said first delay element is a first latch and said second delay element is a second latch.

16. The tone detector of claim 7, further comprising:

a memory for storing information, said memory comprising data for use by said state machine to configure said resonator.

5 17. A method for detecting the presence of a signaling tone on one of a plurality of potential signaling tone frequencies in a communication signal on a transmission line comprising the steps of:

(1) receiving the communication signal at a resonator;

(2) configuring said resonator to resonate at one of the potential signaling tone frequencies;

(3) capturing and storing a first value output by said resonator configured to resonate at said one of the potential signaling tone frequencies;

(4) configuring said resonator to resonate at a reference frequency;

(5) capturing and storing a second value output by said resonator configured to resonate at said reference frequency;

(6) comparing said first value to said second value; and

(7) generating an indicator indicating whether said first value exceeds said second value by a predefined amount.

20 18. The method of claim 17, further comprising the step of repeating steps 2 through 7 for each of said plurality of potential signaling tone frequencies.

19. The method of claim 17, further comprising the steps of:

filtering the communication signal to remove frequencies above a predefined amount;
and

converting the filtered communication signal from analog to digital;

wherein said filtering and converting are performed prior to being received by said

5 resonator.

20. The method of claim 17, further comprising the step of repeating steps 2, 3, 6, and
7 for each of said plurality of potential signaling tone frequencies.

10 21. The method of claim 17, wherein said indicator is an interrupt used to wake a
processor from a low power mode.

22. The method of claim 17, wherein steps 2, 3, 4, and 5 are performed serially.

15 23. The method of claim 17, wherein steps 2, 3, 4, and 5 are performed in parallel.